large amount of thick sputum and followed by the complete disappearance of all signs and symptoms.

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REFERENCES

1. Scrimger, F. A. C.: Postoperative Massive Collapse of the Lung. Surg., Gyn. and Obs. 32:486, June, 1921.

2. Scott, W. J. M.: Postoperative Massive Collapse of the Lung. Arch. Surg. 10:75, Jan. 1925.

3. Scott, W. J. M., and Joelson, James J.: Postoperative Massive Atelectasis, Arch. Surg., 15:855, Dec. 1927.

4. Scott, W. J. M., and Cutler, Elliott C.: Postoperative Massive Atelectasis. Jr. A. M. A. 90:1759, June 1928.

5. Churchill, Edward D.: Pulmonary Atelectasis, With Especial Reference to Massive Collapse of the Lung. Arch Surg. 11:489, Oct. 1925.

6. Jackson, Chevalier, and Lee, Walter Estell: Acute Massive Collapse of the Lungs. Ann. Surg. 82:364, Sept. 1925.

7. Lee, Walter Estelle; Ravdin, I. S.; Tucker, Gabriel, and Pendergrass, E. P.: Studies on Experimental Pulmonary Atelectasis. Trans. Amer. Surg. Assn. 46:314, 1928.

8. Sante, L. R.: Massive (Atelectatic) Collapse of the Lung, With Especial Reference to Treatment. Jr. A. M. A. 88:1539, May 14, 1927.

9. Elliott, T. R., and Dingley, L. A.: Massive Collapse of the Lungs Following Abdominal Operations. Lancet 1:1305, 1914.

10. Coryllos, Pol N., and Birnbaum, George L.: Lobar Pneumonia: Considered as Pneumococcic Lobar Atelectasis of the Lung. Bronchoscopic Investigation. Arch. Surg. 18:190, Jan. 1929, Part II.

DISCUSSION

FREDERICK LEET REICHERT, M. D. (Stanford Hospital, San Francisco).—The two excellent case illustrations in Doctor Mathes' and Doctor Holman's paper offer a beautiful demonstration of the importance of careful and scientific observation in determining the etiology of postoperative massive collapse. Such detailed record of cases facilitates accurate deductions and leads to clarification of the subject.

During the past four years with the further knowledge of the etiology of pulmonary atelectasis, the anesthetist has nearly forgotten his great fear, that of "anesthetic pneumonia." Through his efforts during and at the end of the operation as well as by the improved postoperative care of the patient, this distressing complication is disappearing. Formerly this so-called anesthetic pneumonia was in many cases either massive atelectasis or its offspring, hypostatic pneumonia.

The anesthetist plays an important rôle in its prevention as the authors have indicated. He should warn the operator of its possible development in the individual case from his observations of the duration of the anesthesia, or the presence of mucus, or the position of the patient on the operating table. Often after light anesthesia and before the operative pains are felt by the patient, the anesthetist can prevail upon the patient to expectorate and to cough up a potential mucous plug.

This condition may develop following operative procedures elsewhere than in the abdomen, as the following case will illustrate. After two left craniotomies on a child of seven years under ether anesthesia for the two-stage removal of a brain tumor, a right-sided pulmonary atelectasis developed, and each time, by turning the child onto the left side, tenacious bronchial plugs were coughed out. The long operation with the patient lying on the right side, plus considerable mucus from ether irritation and the prolonged right-sided position in bed to prevent pressure on the operative wound, were all inducive to the development of this complication. The expediency of just rolling the child onto the good side removed the plug with prompt improvement of pulse, respiration and temperature.

CERTAIN OPERATIVE PROCEDURES EMPLOYED IN OPHTHALMOLOGY*

REPORT OF CASES

By JOSEPH L. MCCOOL, M. D.
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WHEN the invitation to present a paper before this section was extended to me my first impulse was to acknowledge my appreciation of the honor and then decline. After discussing the matter it seemed permissible to depart somewhat from the stereotyped procedure of presenting a formal paper on some one particular subject, and instead to give my own personal experiences in dealing with the different surgical conditions which one meets in the daily practice of ophthalmology.

CATARACT OPERATIONS

Because of its importance and the position which it occupies in the list of diseases amenable to operation, cataract operation will be discussed first. Let me say at once that I do not practice the intracapsular operation except in certain selected cases, and then only in such manner as to safeguard the integrity of the eye to the utmost.

Inasmuch as all of us are interested in knowing how other surgeons operate, and how best to improve our own technique, it seemed to me that by describing my own methods of operating I might be able to help someone and that the general informal discussion which I hope will follow will bring out much that will be mutually beneficial. We are, or should be, eclectic in developing our technique.

Preparation. — In preparing the patient for operation I try to break into the routine of his life as little as possible; at the same time I speak of the operation as though it were of no particular moment. Of course the family have been told that it is a procedure requiring more than ordinary skill, judgment, and experience, and even under the very best of conditions may be unsuccessful. I always operate in the late afternoon unless there are specific reasons to do otherwise. There are several good reasons why this has proven satisfactory for me and my patients. The first six hours after the operation are the most important, and the patient during this time should be kept as quiet and free from annoyance as possible. Not infrequently the patient falls asleep after being placed in bed and does not awake for six or seven hours. Then, too, the necessary noises and disturbances incident upon hospital activity are beginning to abate by 4 o'clock in the

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afternoon. Furthermore, I am disinclined to operate in the morning because most of the operations on the ear, nose, and throat are performed at that time, and the commotion and smell of ether is distinctly bad for the morale of a cataract patient. From a purely selfish standpoint it suits my own convenience better to operate in the afternoon, as I use the morning hours from 8:30 o'clock on for my office practice.

The patient is sent to the hospital the morning of the operation. After a preliminary washing with tincture of green soap, the eyebrows and eyelashes of the eye to be operated upon are shaved and clipped. The skin in the immediate vicinity is painted with a solution of hexylresorcinol 1 to 3000, and a sterile pad placed over the eye. Two hours before the time set for the operation the patient is given two allonal tablets, and one drop of 2 per cent homatropin is instilled into the eye. These are repeated one hour before the operation. After the patient is on the table, and while the eye is being cocainized, hexylresorcinol 1 to 3000 is again applied to the skin around the eye. The conjunctival sac is flushed with the same solution.

The fibers of the seventh nerve supplying the orbicularis are then blocked by infiltration anesthesia, using 6 cc. of 2 per cent novocain and adrenalin (Metz). I use a 40 mm. platino-iridium needle, which is sterilized in an alcohol flame. This procedure is routine for every operation in which the eyeball is opened. Within five minutes the orbicularis fibers begin to smooth out and the patient experiences difficulty in closing the lids. By the time I am ready to make my incision forcible closing of the lids is impossible. As a matter of fact, while the nurse is arranging the instruments, frequently I find it necessary to close the upper lid and place a pledget of moist cotton over it to prevent desiccation of the cornea. I have often wondered why this very important and simple procedure is not universally used. That it is not, I know from conversation with other ophthalmic surgeons. I cannot too strongly urge upon all who do not practice it to do so. It is a very simple procedure, practically painless, and gives a sense of security that is of incalculable value.

While it is not my routine practice, in those eyes that are at all congested and in which I have reason to feel that cocain will not suffice to effect a good anesthesia, and also in extremely nervous individuals, I use a deep orbital injection of 2 cc. of 2 per cent novocain. In giving this, the 40 mm. needle is used, previously sterilized in the flame and inserted through the skin of the lower lid, just above the bony rim of the orbit 1 cm. down and in from the external canthal ligament. The needle follows the external orbital wall for about 30 mm., then turned medially between the external and inferior recti muscles, the plunger is withdrawn slightly so as to be sure the point has not entered a vein, and the contents are slowly injected. The infiltration anesthesia thus effected catches the short ciliary nerves from the ciliary ganglion and the long naso-ciliary nerves.

I do not use a subconjunctival injection above the cornea as many men do, as it seems to me that what is gained in anesthetizing the iris for the iridectomy is lost in making an accurate conjunctival flap. I am willing to admit, however, that this objection may be rather more fancied than real.

The separation of the lids may be effected either with lid hooks or with a speculum. The Fisher lid hooks and those devised by Green are undoubtedly effective in giving good lid control. I must admit, however, that, with good akinesis, I am very partial to a small light speculum devised by Wilder. This speculum has a small, flat handle beneath the blades which permits of its being used to raise the lids if the occasion arises. This has an added advantage of giving the assistant a free hand to manipulate the flap and to hold extra instruments.

Corneal Section.—The incision for corneal section is an ample one embracing slightly less than one-half the cornea, and the conjunctival flap is made upon completing this. A single stitch of No. 1 twisted silk is placed in the flap and the loop is spread and laid aside until the lens is extracted.

Iridectomy.—In making the iridectomy the assistant grasps a portion of the loop and the free end of the suture lying over the cornea and gently raises the flap. The iris forceps that I use is not an iris forceps at all, but the small instrument which Elliot uses in grasping the button made by the trephine. I like this instrument because it is short and has the tooth on the under side, which, when the flap is raised, may be placed directly on the iris near the sphincter if a full iridectomy is to be made, and near the periphery if one elects to do a buttonhole iridectomy. If a complete iridectomy is made the blades of the iris scissors are placed so as to coincide with the vertical meridian of the cornea. This gives a smaller coloboma. In making a peripheral iridectomy the cut is easier to make, if the blades of the scissors lie parallel to the incision.

Some surgeons invariably use a complete iridectomy while others prefer a peripheral one. My own practice is to do a complete iridectomy on old people where the cosmetic result is of no particular moment. There is no doubt that the extraction is much easier to perform through a complete iridectomy than through either the intact iris or a peripheral iridectomy; and if reasonable care is exercised in replacing the pillars of the coloboma the cosmetic result is good, as the upper lid covers it to such an extent so as to make it almost invisible. On the other hand, in young individuals—those between forty and sixty—the cosmetic result is not to be considered lightly. In these cases I have been doing a preliminary peripheral iridectomy. This can be done in the office, and is no more difficult to do than a simple paracentesis. The pupil is contracted with several drops of eserin, one grain to the ounce. A small keratome incision about three or four millimeters long is made at the limbus; a very fine iris for-

ceps is inserted and a small piece of iris near the periphery is excised. The eye is bandaged and the patient rests in the office for several hours, and is then permitted to go home. Several days later the extraction is performed. Inasmuch as the pupil is fully dilated at the time of the major operation, this is greatly facilitated by having the iridectomy out of the way. I have done this on a number of patients, and so far have had no reason to regret it.

Delivery of the Lens.—There are numerous methods of extracting the lens, both intra- and extracapsular. You are, of course, familiar with all of them. I have tried many of them and have finally adopted the following technique as being, in my hands at least, the safest and most efficient. Two types of capsule forceps are used, depending upon the prominence of the eye. If the eye is small, shrunken, or the brow prominent, the new model Ewing forceps is selected. If the eye is large and fairly prominent, giving plenty of room for manipulation, the new Vail forceps are used. The assistant gently raises the conjunctivo-corneal flap and the forceps are inserted close to the lower border of the iris; when they reach this point the tips are depressed and passed behind the lower portion of the iris and at this point opened. A fairly large bite of capsule is taken in the grasp of the forceps and held while a large expression hook makes pressure below the lower limbus. If the capsule is more resistant than the zonule the lens will be delivered in its capsule. No more pressure need be applied than in the extracapsular operation. If, however, the capsular is less resistant than the zonule the former comes away, converting the operation into an extracapsular one with the difference that by taking a grasp of the capsule low down behind the lower margin of the iris a larger bite of capsule comes away with the forceps than with any other method with which I am familiar.

In the January issue of the *Archives of Ophthalmology* Colonel Henry Smith presented a paper concerning a new method of extraction in the capsule by which he tumbled all lenses, incipient, intumescent, mature and sclerosed, by making pressure five to six millimeters below the limbus, thereby forcing the vitreous forward between the ciliary body and the lower edge of the lens. Since reading that article I have, without changing the fixation of the lens with forceps, dropped the expression hook from the limbus to a point five or six millimeters below this and made pressure there. A very useful instrument for making this pressure is the one recently devised by Swartz of St. Louis, which I commend to you. If the lens tumbles, the cornea is tucked in behind the advancing lens and the upper zonule fibers are gently broken by raking the lens sideways with the concave edge of the hook after the lens lies outside of the eye. The stitch is then tied, the iris is replaced and the eye is closed. If the capsule ruptures after the stitch is tied lightly, the cortex is washed out with one-half normal salt solution. It is evident, of course, that there is nothing original in this technique. I have taken what is best from that suggested by operators of vaster experience than mine. However, there is this to be said about it: at no time is more pressure used than is justifiable, and in more than half of my cases the lens is extracted in its capsule. In those in which the capsule ruptures, a large enough piece comes away so as to make a needling rarely necessary.

Concerning its applicability in complicated cataracts I should like to point out a few points in the technique which have proven useful in a few cases. It is, of course, understood that the eye is free from all signs of active inflammation. When possible I do a full complete preliminary iridectomy, waiting several weeks if necessary before extracting the lens. The usual incision and flap are made. The iris is then separated from its attachment to the lens by passing a spatula beneath one edge of the coloboma and sweeping it around the circumference of the pupil until the iris is freed from the lens. The breaking of these posterior synechiae usually causes considerable bleeding, and it is necessary to wash the blood out of the anterior chamber before applying the capsule forceps. By reason of the antecedent inflammation there is usually considerable fibrous tissue on the anterior capsule which is easily grasped by the forceps. The ease with which these lenses are dislocated and delivered in their capsule would suggest that changes have taken place which render the zonule fibers very friable.

It is particularly desirable to be able to extract the lens in its capsule in this type of case, for retained cortex and capsule will almost surely cause an iridocyclitis which is likely to nullify the result of the operation. On the other hand, the eye does surprisingly well if one is successful in effecting an intracapsular delivery.

Secondary Cataract.—In dealing with the capsule which remains after a capsulotomy operation, if it is thin and does not give the appearance of toughness, I use a Ziegler knife needle. If I have reason to believe that the capsule is tough and dense, I prefer to cut it with a small De Wecher scissors through a keratome incision. An annoying and at times a serious sequela of a cataract extraction is hypertension, with the usual accompaniment of diminution of central vision and contraction of the field. In the capsulotomy operation this is occasionally brought about by the incarceration of tags of capsule and vitreous in the wound. Not infrequently a partial prolapse of the iris, not enough to act as a subconjunctival drain, may be responsible for the hypertension. I have seen it occur following an intracapsular extraction where the iris has become adherent to the hyaloid at the pupillary margin, and in a few cases of hernia of the vitreous into the anterior chamber. By cutting the capsule and vitreous bands with a knife needle or, if the former ap-

pears too dense, with a De Wecher scissors, the hypertension may sometimes be relieved.

If the hypertension occurs following an intracapsular extraction, I have used a small Homer Smith capsulotomy needle to separate the margin of the pupil from the underlying hyaloid, cutting through the latter upon withdrawing the needle.

Finally it may be necessary to trephine below. Some surgeons have succeeded in reducing the tension by withdrawing one of the pillars of the coloboma beneath a previously dissected conjunctival flap as is done in the iridotasis operation. I have had no experience with this procedure, prefering to trephine below or even on either side.

GLAUCOMA WITH COMPLICATIONS

We are often confronted with the problem of what to do in simple glaucoma complicated by the development of cataract. I feel that I have no right to offer advice, for my experience has been too limited. At any rate I shall give you my views in the hope that there may be something helpful in them.

If, when the patient with simple glaucoma is first seen, incipient cataract be present and there is reason to believe that in the near future, in spite of the control of the glaucoma, sight will be impaired to such an extent so as to necessitate an extraction, two courses are open to us. One, we may elect to trephine above and later extract the lens below, or, two, we may perform a La Grange sclerectomy above and later extract the lens, as usual, above. I have practiced both of these procedures successfully and recommend them for your consideration.

The surgical procedures which have been advocated for the permanent reduction of the hypertension in glaucoma have been many and varied. As this paper is intended to be one of personal experience and preference, I shall refer only to the few that I have used.

It is the almost universal practice, in this country at least, to relieve an acute congestive glaucoma by making a broad, deep iridectomy. With the technique of this operation you are all familiar. Let me recommend that before operating, whether by local or general anesthesia, that a deep orbital injection of 2 per cent novocain and adrenalin be given. I was called upon to operate upon a woman with an intumescent cataract which had caused an acute congestive glaucoma, and inasmuch as it was inadvisable to give a general anesthetic, I gave her a deep orbital injection of novocain and adrenalin. Before I was ready to make my incision the tension had diminished appreciably, and the extraction of the cataract was uneventful and painless.

In simple chronic glaucoma, Elliot's sclerocorneal trephine operation, La Grange's sclerectomy and Borthen's iridotasis are the operations which most surgeons employ. For a time I was partial to iridotasis, and I have a number of cases in which it reduced the tension satisfactorily, but the unsightly pear-shaped pupil, and in several cases a rather large bleb which overlapped the cornea, made me abandon it in favor of trephining. I believe also that in a given number of cases trephining will reduce the tension more effectively than iridotasis. This is particularly true in cases of long standing in which the base of the iris is firmly attached to the posterior surface of the cornea. I know of several patients whose eyes I might have saved had I chosen to do a trephining instead of an iridotasis.

I do not believe anyone can improve on Elliot's operation so far as technique is concerned, and my only departure from it is to make my incision in such a way so that the ends may be as far removed from the cornea as is consistent with an adequate exposure of the area to be trephined. This leaves a large area of undisturbed subconjunctival tissue to either side of the trephine opening, thereby greatly increasing the drainage facilities.

ENUCLEATION

I feel as though I should apologize for touching upon the subject of enucleation, and yet I feel sure that many surgeons still adhere to the practice of simple enucleation without implanting some substance into Tenon's capsule. I have been using the Frost-Lang operation since 1910 with very satisfactory results. Many substances have been advocated, but I have found that a hollow gold sphere about 16 millimeters in diameter is easy to procure, simple to insert and usually stays in place. I have yet to have one extruded. In several cases I tried an implant of fat. This lengthened the operating time considerably, and I do not believe that it is any better than a gold ball. In enucleating under local anesthesia, as one occasionally does, it certainly complicates the operation to be obliged to block off an area on the abdomen in order to remove the necessary fat and fascia. Enucleation under local anesthesia may be performed painlessly provided the patient is at all tractable. A preliminary injection of morphin and hyoscin places the patient in what Crile calls a neutral state. By nerve-blocking the lids to relax them, injecting around the insertion of the muscles and along their bellies, and by catching the long and short ciliary nerves with a deep orbital injection augmented by more of the anesthetic, injected back of the globe after the recti are severed, an almost, if not completely, painless enucleation may be performed. It has been estimated by Labat that one may inject with safety as much as 30 cc. of 2 per cent novocain in the average individual.

The point in technique which has served me satisfactorily and which I should like to pass on to you, is that I make no attempt to catch up the individual muscles, but instead cut them close to the globe, disturbing their attachment to Tenon's capsule as little as possible. After the eye is enucleated and bleeding has been stopped, a pledget of cotton is inserted in the capsule to absorb any oozing, while a purse-string suture is placed in the capsule. This is of No. 4 braided silk entered from the lower conjunctival surface and passed

over and over the free edge of Tenon's capsule, making its exit on the conjunctival surface alongside the point of entrance. After the pledget of cotton is removed, the gold ball is inserted, the suture drawn taut and the ends threaded through the holes of a small button and tied on the conjunctival surface. The conjunctiva is sutured horizontally with No. 1 black silk. The buried silk suture may be removed in ten days.

There is nothing original about this technique, but I can recommend it as very simple, effective, and capable of imparting considerable rotation to the prothesis.

CONJUNCTIVOPLASTY

Finally, I should like to call your attention to the value of conjunctivoplasty, not only in injuries to the anterior ocular segment, but also in certain types of corneal ulcers. In incised and lacerated wounds of the cornea and sclerocorneal junction either with or without iris prolapse, if the injury is at all extensive an apron of conjunctiva may be fashioned and the wound covered. If there is iris prolapse this must be excised and the lips of the wounds cauterized either with phenol or trichloracetic acid before it is covered with conjunctiva. Certainly many eyes have been saved by this procedure which might otherwise have been lost.

Not alone in injuries to the cornea, but in ulceration of this membrane as well has conjunctivoplasty proven its usefulness. In this connection let me quote from a paper in which I reported a case in which one eye was affected with marginal ring ulcers and in which conjunctivoplasty undoubtedly saved it.

REPORT OF CASE

The patient whose left eye serves as the basis of this report was a Scotch woman, fifty-eight years of age, married and the mother of two grown sons. She was thin, spare, enjoyed poor health and hoped for the worst. She was absolutely devoid of a sense of humor and was chronically underfed from choice. This element of undernourishment undoubtedly was a large factor in the development of the severe ulceration of her left cornea which very nearly destroyed this entire membrane.

In August 1924, the patient consulted me complaining of a scratchy feeling in the right eye. Examination of the eye revealed a localized area of pericorneal injection to the nasal side of the cornea. Just at the limbus there was a small round ulcer which stained with fluorescin. Ointments containing holocain and mercurophen, holocain and novoform, were used, alternating with a 2 per cent solution of mercurochrome and a zinc and boric lotion. The ulceration finally healed although it took a month to do so.

One month later she had another attack in the same eye, and of the same character; this healed promptly with the same medication as used in the first attack. After the lapse of a year, during which time she was free from any ulcers, she returned with quite a large ulcer on the left cornea. One week previously she had had what she described as an acute sore throat. Since then both eyes had been uncomfortable, but the left one showed the ulceration.

The ulcer was about 4 millimeters long by 1 millimeter wide, concentric with the limbus, extending from nine to eleven o'clock. It was yellow-gray in color, and for a time showed no tendency either to spread or heal. Scrapings from it failed to show any distinctive organisms. Pericorneal injection was localized, and at this time there was no iritis, although this developed later. At first the ulcer was treated with holocain, mercurophen and zinc, which made no impression on it. Applications of 2 per cent mercurochrome and iodin were made to the base after curetting away the slough. Pasteurization after the method of Prince and the use of the thermophore, both seemed to irritate rather than allay the subjective symptoms, and certainly failed to check the ulcer's spread. Milk injections were also used.

At this time it became evident that what at first seemed to be but a mild form of ulceration, was indeed formidable and was spreading slowly but surely. Fortunately the extension was concentric with the limbus, at no time showing any tendency to advance over the pupillary area. In fifteen days, however, the ulcer had spread from its original position, between nine and eleven, so that it came to occupy that portion of the circumference of the cornea which lay between five and two o'clock, leaving but a quarter of the circumference of this membrane free, between two and five. Throughout its course it was concentric with the limbus and varied in width from 1 to 3 millimeters opposite one o'clock; it measured nearly 4 millimeters in width.

Under cocain anesthesia the ulcer was curetted, and over the base and beneath the edges, the flat end of a toothpick saturated with 50 per cent trichloracetic acid was passed. This, too, failed to check its progress. Fearing to wait any longer a conjunctivoplasty was decided upon and performed under ether.

A flap of conjunctiva was dissected from above and one from below the cornea, and they were drawn over the cornea in such a manner as to leave a small, shuttle-like clear space in the center of this membrane with its long axis between ten and four. The two stitches placed at the limbus were at these points. Both eyes were bandaged three days. After this the unoperated eye was uncovered. The lower stitch, that opposite four o'clock, gave way several days later, and the upper one was removed in a week. The lower flap of conjunctiva gradually receded to its original position, leaving the underlying cornea smooth and healthy. In this portion of the cornea the ulcer had not burrowed very deeply into the substantia propria and, although Bowman's membrane was destroyed and the defect filled in with scar tissue, the resulting scar was much less dense than one would have expected.

Unlike the lower flap of conjunctiva, the upper one remained in position over the cornea, and failed to retract completely to its original position. That portion which remained filled in the upper limb of the ulcer, and formed part of the ultimate cicatrix. However, there was enough recession to insure a free pupillary area.

Fortunately the patient has a slight natural ptosis and only a slight scar. From a cosmetic standpoint the result left little to be desired. Of course, the cicatricial contraction left a rather high myopic astigmatism, but since the pupillary area was not attacked by the ulceration it is regular, and with correction the patient's vision is 20/30.

The technique of conjunctivoplasty presents particular difficulties, and is familiar to you all. Care should be taken to make the flap large enough so that there shall be the minimum amount of traction on the suture.

Conjunctivoplasty certainly proved of immeasurable value in the case above reported. I am convinced that had I not used it the patient in all probability would have lost her eye.

Not long after the above report was submitted the patient's other eye became involved in a similar manner. Profiting by the experience of the first eye, conjunctivoplasty was practiced earlier and with as gratifying results.

Four-Fifty Sutter.